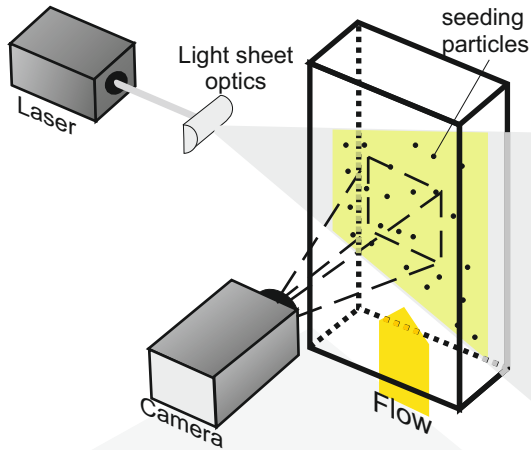
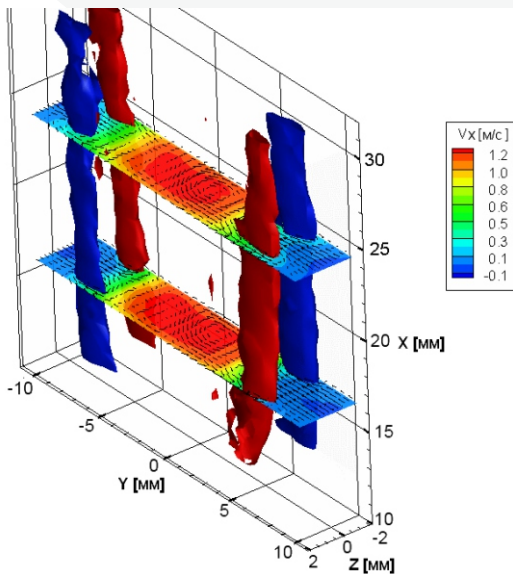


PIVIT: Particle Image Velocimetry



PIV measurement sketch



Isosurfaces of vorticity and average velocity maps in the cross-sections of a jet in a slot channel. Tomographic PIV measurements (Institute of Thermophysics results)

Applications

Particle Image Velocimetry (PIV) is a non-intrusive technique to measure whole field velocity maps in fluid flows. PIV makes it possible to measure instantaneous two- or three-component vector fields in a cross-section of a flow. Volumetric measurements are possible using plane-by-plane scanning or whole 3D field mapping.

PIV is used for:

- › liquid and gas flow measurements in wind tunnels
- › studies of hydrodynamic lab flows
- › testing facilities for cars, turbines, pumps, compressors and
- › environmental modeling
- › velocity measurements in flames and sprays
- › validation of numerical simulation results

PIV can measure:

- › instantaneous snapshot of a velocity map
- › turbulence level
- › vortices and streamlines
- › statistical and spectral characteristics of a flow

Measurement principle

Basic principle of flow velocity measurements is to measure velocity of small particles added to the flow. Lasers are used to illuminate particles. Images recorded by digital cameras are then processed to evaluate particle (i.e. flow) velocity maps.

PIV system types

PIV (2C2D PIV) - one digital camera is used to measure two-component velocity vectors in a cross-section of a flow.

Stereo PIV (3C2D PIV) - two cameras in stereoscopic configuration measure three-component velocity vectors in a cross-section

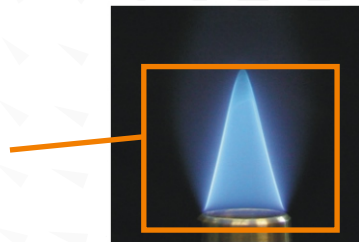
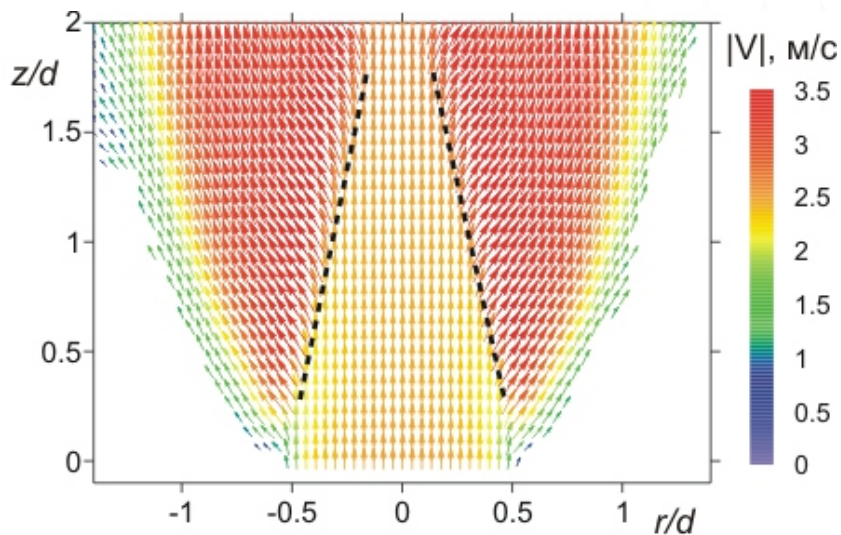
Tomo PIV (3C3D PIV) - three or four cameras record particle images from different directions. Tomographic image reconstruction is used to get 3D images of particles in the measurement volume. The result is three-component vectors on a 3D grid.

Micro PIV (2C2D uPIV) - single camera and a microscope are used to record particle images. This technique is used to measure two-component velocity field with micron resolution.

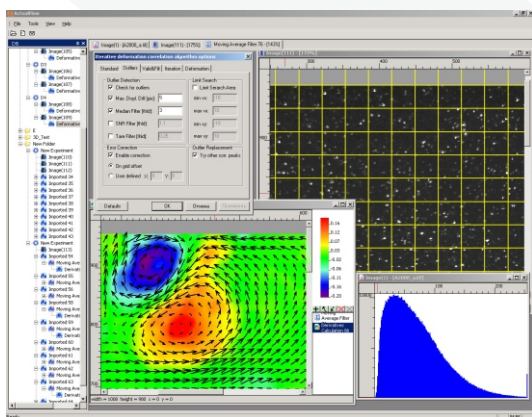
Time-resolved PIV (2C2D or 3C2D TRPIV) - high-speed cameras and lasers are used to measure two- or three-component velocity fields with high temporal resolution.



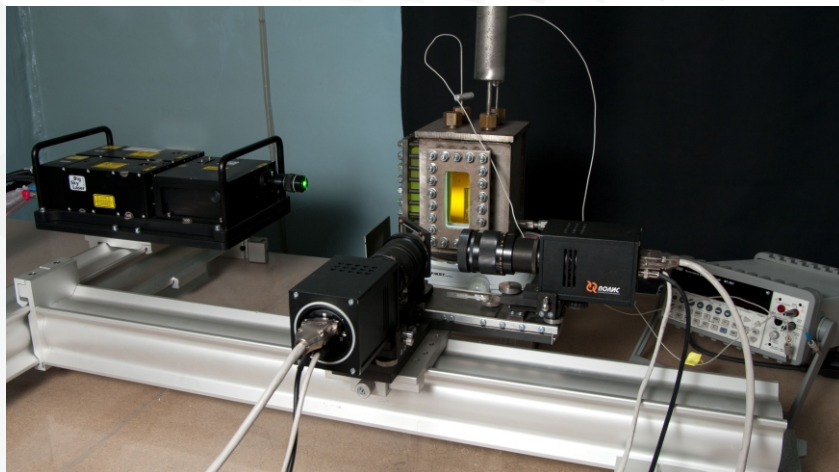
Camera on a mount for StereoPIV



Laminar Bunsen flame (right) and measured velocity map (left)
(Institute of Thermophysics results)



ActualFlow software



POLIS system overview

POLIS system is a powerful and flexible system for lab and testing measurements. The system is compact and mobile. Most systems are customized according to end-user requirements and equipped with devices of different vendors. Typical system consists of the following elements:

- Nd:YAG double pulsed laser with light-sheet optics (wavelength - 532nm, energy per pulse - up to 380mJ, typical repetition rate - 10-15Hz).
- Digital CCD and CMOS cameras with resolution up to 16 Mpix.
- Synchronizing device
- Seeding particles for liquid and gas flows (polyamide particles, fog generators, titanium particles for flame seeding)
- Targets and camera mounts for calibration in Stereo and Tomo configurations

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